

### **BRIEF DESCRIPTION OF THE FIGURES**

The above and other objects and advantages of this invention will be apparent upon consideration of the following detailed description, taken in conjunction with the accompanying drawings in which like characters refer to like elements throughout and in  
5 which:

FIG. 1 and FIG. 1 A depict front, rear and perspective views respectively of a hand-held electrostatic spraying device and multiple replaceable reservoir or cartridge made in accordance with a preferred embodiment of the present invention;

FIG. 2 and FIG. 2 A depict top and cross-sectional views of a multiple replaceable  
10 reservoir or cartridge made in accordance with a preferred embodiment of the present invention;

FIG. 3 and FIG. 3 A depict top and cross-sectional views respectively of alternate multiple replaceable reservoir or cartridge made in accordance with a preferred embodiment of the present invention;

15 FIG. 4 and FIG. 4A depict top and cross-sectional views respectively of alternate multiple replaceable reservoir or cartridge made in accordance with a preferred embodiment of the present invention;

FIG. 5 and FIG. 5A depict top and cross-sectional views respectively of alternate replaceable reservoir or cartridge made in accordance with a preferred embodiment of the  
20 present invention;

FIG. 6 and FIG. 6A depict top and cross-sectional views respectively of alternate replaceable reservoir or cartridge made in accordance with a preferred embodiment of the present invention;

FIG. 7 and FIG. 7A depict top and cross-sectional views respectively of alternate replaceable reservoir or cartridge made in accordance with a preferred embodiment of the present invention;

FIG. 8 and FIG. 8A depict top and cross-sectional views respectively of alternate  
5 replaceable reservoir or cartridge made in accordance with a preferred embodiment of the present invention;

FIG. 9, FIG. 9A, FIG. 9B and FIG. 9C depict front, rear and cross-sectional view respectively of a hand-held electrostatic spraying device having at least one replaceable reservoir or cartridge, at least one replaceable spraying nozzle region, a high voltage  
10 generator, a power source, control circuit, trigger and terminals connected to a high voltage generator made in accordance with a preferred embodiment of the present invention;

FIG. 10, FIG. 10A, FIG. 10B and FIG. 10C depict front, rear and cross-sectional view respectively of a hand-held electrostatic spraying device having at least one replaceable  
15 reservoir or cartridge, at least one replaceable spraying nozzle region, a high voltage generator, a power source, control circuit, trigger and terminals connected to a high voltage generator made in accordance with a preferred embodiment of the present invention;

FIG. 11, FIG. 11A, FIG. 11B and FIG. 11C depict front, rear and cross-sectional  
20 view respectively of a hand-held electrostatic spraying device having at least one replaceable reservoir or cartridge, at least one fixed spraying nozzle region, a high voltage generator, power source, control circuit, trigger and terminals connected to a high voltage generator made in accordance with a preferred embodiment of the present invention;

FIG. 12, FIG. 12A, FIG. 12B and FIG. 12C depict front, rear and cross-sectional view respectively of a hand-held electrostatic spraying device having at least one replaceable reservoir or cartridge, at least one fixed spraying nozzle region, a high voltage generator, power source, control circuit, trigger and terminals connected to a high voltage generator  
5 made in accordance with a preferred embodiment of the present invention;

FIG. 13, FIG. 13A, FIG. 13B and FIG. 13C depict front, rear and cross-sectional view respectively of a hand-held electrostatic spraying device having at least one replaceable reservoir or cartridge, at least one replaceable spraying nozzle region, a pumping means, a high voltage generator, power source, control circuit, trigger and terminals connected to  
10 a high voltage generator made in accordance with a preferred embodiment of the present invention;

FIG. 14, FIG. 14A, FIG. 14B and FIG. 14C depict front, rear and cross-sectional view respectively of a hand-held electrostatic spraying device having at least one replaceable reservoir or cartridge, at least one replaceable spraying nozzle region, a pumping means,  
15 a high voltage generator, power source, control circuit, trigger and terminals connected to a high voltage generator made in accordance with a preferred embodiment of the present invention;

FIG. 15, FIG. 15A, FIG. 15B and FIG. 15C depict front, rear and cross-sectional view respectively of a hand-held electrostatic spraying device having at least one replaceable  
20 reservoir or cartridge, at least one fixed spraying nozzle region, a pumping means, a high voltage generator, power source, control circuit, trigger and terminals connected to a high voltage generator made in accordance with a preferred embodiment of the present invention.

FIG. 16, FIG. 16A, FIG. 16B and FIG. 16C depict front, rear and cross-sectional view respectively of a hand-held electrostatic spraying device having at least one replaceable reservoir or cartridge, at least one fixed spraying nozzle region, a pumping means, a high voltage generator, power source, control circuit, trigger and terminals connected to a high voltage generator made in accordance with a preferred embodiment of the present invention.

FIG. 17, FIG. 17A, FIG. 17B and FIG. 17C depict cross-sectional and partial enlarged view respectively of a hand-held electrostatic spraying device having a pumping means for pneumatically pumping said the material from the reservoir to the nozzle made in accordance with a preferred embodiment of the present invention.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A hand-held electrostatic spraying device made in accordance with the first preferred embodiments of the present invention is depicted in perspective, front and rear views in FIG. 1 and FIG. 1 A. The hand-held electrostatic spraying device 10 integrated multiple replaceable reservoir or cartridge 20 is depicted attached to a hand-held electrostatic spraying device 10.

A multiple replaceable reservoir or cartridge made in accordance with the first preferred embodiments of the present invention is depicted in top and cross-sectional views in FIG. 2 and FIG. 2 A. The multiple replaceable reservoir or cartridge 20 shown in FIG. 2A comprises a plurality of separate electrostatically sprayable material storage region 22, each of which is contained in a three-dimensional sector of the replaceable reservoir or cartridge. The replaceable reservoir or cartridge 20 has a material conducting tube region 40 that is continuously in directly connect with the spraying nozzle region 31. Delivery of an electric charge through a selected terminal 34 to a designated spraying nozzle 30 sublimates the electrostatically sprayable material into many droplets which are focused when the forward extremity of the nozzle-ring configuration 50 is brought within a predetermine distance from an earthed target to be sprayed.

FIG. 3 and FIG. 3 A depict variants of the first preferred embodiment in which the nozzle 30 is mounted in fixed relation to the body of the multiple replaceable reservoir 20.

In one alternative embodiment shown in FIG. 4 and FIG. 4A, a multiple replaceable reservoir or cartridge 20 comprises a plurality of separate electrostatically sprayable material storage region 22, each of which is contained in a three-dimensional sector of the replaceable reservoir or cartridge. The replaceable reservoir or cartridge 20

has a material conducting tube region 40 and a pumping means 70 that is continuously in directly connect with the spraying nozzle region 31 in which pumping of the material is produced in response to operation of actuating means by the user. Delivery of an electric charge through a selected terminal 34 to a designated spraying nozzle 30 sublimates the electrostatically sprayable material into many droplets which are focused when the forward extremity of the nozzle-ring configuration 50 is brought within a predetermine distance from an earthed target to be sprayed.

In another alternative embodiment shown in FIG. 5 and FIG. 5A, a replaceable reservoir or cartridge 20 comprises an electrostatically sprayable material storage region 22, which is contained in a three-dimensional sector of the replaceable reservoir or cartridge. The replaceable reservoir or cartridge 20 has a material conducting tube region 40 that is continuously in directly connect with the spraying nozzle region 31. Delivery of an electric charge through the terminal 34 to spraying nozzle 30 sublimates the electrostatically sprayable material into many droplets which are focused when the forward extremity of the nozzle-ring configuration 50 is brought within a predetermine distance from an earthed target to be sprayed.

In another alternative embodiment shown in FIG. 6 and FIG. 6A, a replaceable reservoir or cartridge 20 comprises a electrostatically sprayable material storage region 22, which is contained in a three-dimensional sector of the replaceable reservoir or cartridge. The replaceable reservoir or cartridge 20 has a material conducting tube region 40 and a pumping means 70 that is continuously in directly connect with the spraying nozzle region 31 in which pumping of the material is produced in response to operation of actuating means by the user. Delivery of an electric charge through the terminal 34 to

spraying nozzle 30 sublimates the electrostatically sprayable material into many droplets which are focused when the forward extremity of the nozzle-ring configuration 50 is brought within a predetermine distance from an earthed target to be sprayed.

In yet other embodiment of the present invention, the replaceable reservoir 20 can also include just one nozzle 30, as showed in FIG. 7 and FIG. 7A, one nozzle 30 and a pumping means 70, as showed in FIG. 8 and FIG. 8A.

A complete hand-held electrostatic spraying device 10 having multiple replaceable reservoir or cartridge 20, at least one replaceable spraying nozzle region 33, a high voltage generator 60, a power source 82, control circuit 80, a trigger 81 and terminals 61 connected to the high voltage generator 60 made in accordance with the first preferred embodiment of the present invention is shown in FIG. 9, FIG. 9A, FIG. 9B and FIG. 9C. The multiple replaceable reservoir or cartridge 20 shown in FIG. 9, FIG. 9A, FIG. 9B and FIG. 9C comprises a plurality of separate electrostatically sprayable material storage region 22, each of which is contained in a three-dimensional sector of the replaceable reservoir or cartridge. The hand-held electrostatic spraying device 10 has multiple terminals 61 that directly connect with a high voltage generator 60. By connecting the terminals 61 to a designated terminal 34 from a multiple replaceable reservoir or cartridge 20, delivery of an electric charge through selected terminals 61 and 34 sublimates the electrostatically sprayable material into many droplets which are focused when the forward extremity of the nozzle-ring configuration 50 is brought within a predetermine distance from an earthed target to be sprayed.

In one alternative embodiment shown in FIG. 10, FIG. 10A, FIG. 10B and FIG. 10C, a hand-held electrostatic spraying device 10 having wiring 014 can be integrated

with a replaceable reservoir or cartridge 20 having single electrostatically sprayable material storage region 22 to ionize single material into electrostatically charged droplets.

In another alternative embodiment shown in FIG. 11, FIG. 11A, FIG. 11B, FIG. 11C, FIG. 12, FIG. 12A, FIG. 12B and FIG. 12C, a hand-held electrostatic spraying device 10 having a plurality of separate electrostatically sprayable material storage region 22 or having a single electrostatically sprayable material storage region 22 can be integrated with a fixed spraying nozzle region 32 to generate single or multiple materials into electrostatically charged droplets. Each material 23 from individual material storage region 22 can be applied an electric charge through a selected terminals 61 and 34 in a passive feed arrangement.

In a further alternative embodiment shown in FIG. 13, FIG. 13A, FIG. 13B, FIG. 13C, FIG. 14, FIG. 14A, FIG. 14B and FIG. 14C, a hand-held electrostatic spraying device 10 having a plurality of replaceable reservoir or cartridge 20 or having a single replaceable reservoir or cartridge 20 can be applied through a pumping means 70 to supply material 23 from the material storage region 22 to the spraying nozzle region 31 for further electrostatic spraying at nozzle.

In yet other embodiment of the present invention shown in FIG. 15, FIG. 15A, FIG. 15B, FIG. 15C, FIG. 16, FIG. 16A, FIG. 16B and FIG. 16C, a hand-held electrostatic spraying device 10 having a plurality of separate electrostatically sprayable material storage region 22 or having a single electrostatically sprayable material storage region 22 can be integrated with a fixed spraying nozzle region 32 to generate single or multiple materials into electrostatically charged droplets. Each material 23 from



individual material storage region 22 can be supplied to the spraying nozzle region 31 through a pumping means 70 for further electrostatic spraying at nozzle.

In yet other embodiment of the present invention shown in FIG. 17, FIG. 17A, FIG. 17B and FIG. 17C, a hand-held electrostatic spraying device 10 having a plurality of  
5 separate electrostatically sprayable material storage region 22 or having a single electrostatically sprayable material storage region 22 can be integrated with a fixed spraying nozzle region 32 to generate single or multiple materials into electrostatically charged droplets. Each material 23 from individual material storage region 22 can be supplied to the spraying nozzle region 31 through a pumping means 70 having a trigger  
10 81 actuated piston 91 to pneumatically pumping said material 23 from material storage region 22 to spraying nozzle region 32 for further electrostatic spraying at nozzle.

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